praise is due both to the author for their judicious selection, as well as the artists for their excellent execution of the same.

FRED KAMMERER.

THE DISINFECTION OF THE PHYSICIAN'S HANDS, WITH OBSERVATIONS ON THE BACTERIOLOGICAL CHARACTER OF THE ACCUMULATIONS UNDER THE FINGER-NAILS.[1]

Of the many brochurés which have in late years appeared, and which treat of the theme of the disinfection of the hands of the physician, two are worthy of especial notice. These papers were written by Kümmel 1885-6. This author attempted to find a means by which the hands could be freed from micro organisms,irrespective of the question of their innocuousness or their dangerous characters. The separation of micro-organisms into pathogenic and non-pathogenic so far as the above question of disinfection is concerned, is still only of theoretical value. The practical side is still to free the fingers of all varieties of germs. Kümmel found that the disinfection of the hands is by far a more difficult task than the disinfection of instruments and other septic utensils. The fissures and rhagades in the hands make the task a very laborious one. Kümmel's process of washing each hand carefully with very warm water and potash soap and brush, and the combination therewith of a 5% solution of carbolic acid, makes this a very irritating method to some delicate hands. After the above disinfecting method the fingers were carried into nutritive gelatin, and if no colonies of micro-organisms appeared after a few days the hands were considered aseptic. Forster, of Amsterdam, and his pupil Wassing, have proceeded in a similiar manner. Forster found that the disinfection of the hands *a la* Koch was no easy matter. The methods in vogue in practice to free the hands of germs did not, according to Forster, accomplish this object. Forster found that a one or one-half pro mille solution of sublimate gave the best results in disinfecting the hands, while Kümmel found these useless, and the most satisfying solution to him appeared the one in five of carbolic acid, an apparent contradiction in the work of these authors. Professor P. Fürbringer in the above paper has gone a step further. He proves that fingers supposed aseptic and carried or bored into gelătin will not give reliable data as to their degree of freedom from germs. The subungual space does not come into contact with the elastic gelatin, and fingers which might infect the peritoneum when bathed in the warm fluid of this cavity, will leave the gelatin apparently aseptic. Fürbringer could find a correspondence between the subungual space (bacteriologically) and the previous occupation of the hands of the physician. The ungual side of this space was more fertile ground for these organisms than the dermal side. When this filth is examined with aniline dye directly with the microscope, the number of micro-organisms is far less than the particles of dust, mineral, and vegetable. It is rare to find the micro-organisms in the majority (as regards numbers) and much rarer is it to find pictures suggesting fecal matter. If the filth of the subungual space be cultivated in media, we find that the varieties of micro-organisms may be very great, or there may be a marked preponderance of one peculiar variety of microbe. Between these two extremes we find all gradations. In the growth of the bacteria it is probable that certain forms of micro-organisms eventually exterminate others less tenacious of growth; hence the preponderance of this form.

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[1] Untersuchungen und Vorschriften über die Desinfection der Hände des Arztes nebst Bermerkungen über den bakteriologischen Charakter des Nagelschmutzes von Prof. P. Furbringer, Director am Berliner Krankenhaus Friedrichshain.

The above index of the bacteriological results to the latest occupation of the physician is a marked result of Furbinger's investigations, yet there were fingers which for days had not come into contact with pus, and yet after disinfection the particles from the subungual space showed the presence of the staphylococcus.

Again, *exceptionally*, where the hands had but recently been in contact with pus and no previous marked disinfection of the hands had been performed, the coccus was absent. In all experiments the filth of the subungual space, though very minute in quantity, gave a large number of microbe colonies in cultivation.

Again, it is to be remarked that where the hands had been in manipulation with putrid post-mortem material or abcesses, the filth of the subungual space did not when cultivated, produce such a striking contrast to the result obtained from the normal filth of the fingers as one would expect. The author's method was to extract from the subungual space of the *disinfected* hands of the physician particles of matter almost macroscopically invisible and carry these particles to sterilized gelatin tubes. The gelatin in these tubes being fluidified, then agitated,and placed on an incline. The plates were only used to study in exceptional cases, characters of the colonies. A sterilized platinum point, or a clean pointed match end was used to extract the particles. Assistants and chiefs of clinics were subjects of experiment. Thirteen men were examined in this way after they had most painfully and diligently disinfected their hands, fingers, etc., according to prescribed methods in vogue. The time employed to brush, disinfect and trim the hands varied from two to ten minutes. The solutions used were carbolic or sublimate combined with soap. In *only one case were no cultures* of *colonies* of micro-organisms obtained. The author found that if any solution aided the disinfection of the hands better than another it was sublimate (Forster).

Again, different agencies from the brush or fluid used influenced the thoroughness of the disinfecting process, the insensible oiliness of the skin protected micro-organisms from the deleterious action of solutions when in pure cultures they were rendered innocuous, even with solutions of milder stength. The author endeavored to find a method of removing the oily layer in the epidermis, to shorten the time cf disinfection and at the same time not injure the hands.

Without going into greatdetail we may summarize the following: After using the most irritating alkalies 10% and 5% solutions,brushing the hands and nails for a variable length of time, and then treating with strong carbolic and sublimate solutions the author found that he obtained colonies in the gelatin. The following method was found to give brilliant results and the most perfect disinfection of the hands and subungual space. The nails having first been carefully trimmed and cleaned from visible filth, the hands are cleaned for a minute or a minute and a half with brush and soap, especially the subungual space.

The hands are then washed in not less than 80% alcohol for a minute, and then before evaporation of the same they are brought into a 2-1,000 solution of sublimate or 3% carbolic acid solution, and washed for an additional minute. The advantages of the above, are first, the, *certainty* of disinfection, the saving of time, the sparing of the hands and finally the cheapness. By the above method either none or only one or two colonies (germs) were found in a culture. It is useful to know that in order to prevent decomposition of the bichloride in water, the author finds the following a stable solution and equivalent after months to a solution of sublimate in distilled water, strength one pro mille. To two litres of clean well-water add 10 c.cm. of an alcoholic solution of sublimate (1 in 5) and one gramme of acid aceticum Ph. G.

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